

## **REMARKS**

### **Reply to Arguments in Advisory Action**

The Advisory Action mailed on May 29, 2003 stated that the Applicant's argument, of the May 19, 2003 Response After Final, that it would not be obvious to formulate a slurry having the formulations claimed in independent claims 1 and 11 in light of Kaufman et al. (U.S. Patent No. 5,954,997) was unpersuasive. The reasoning stated by the Examiner was that it has been acknowledged that Kaufman in view of Feller et al. (U.S. Patent No. 5,700,383) differ in failing to teach a surfactant containing an alkyltrimethylammonium cation and that Grumbine et al. (U.S. Patent No. 6,083,419) cures the deficiency of Kaufman and Feller by teaching a cmp slurry comprising corrosion inhibitors that produce alkyl ammonium ions in aqueous solutions upon dissolution. The Applicant respectfully submits that the corrosion inhibitors as taught by Grumbine for the use in a chemical mechanical polishing slurry for tungsten would not be used in a copper polish slurry, such as the one taught by Kaufman because copper and tungsten have different oxidation and corrosion properties. This submission is supported by a signed 37 C.F.R. 1.132 declaration by the Applicant attached to the current response.

Additionally, the Advisory Action stated that the Applicant's unexpected results argument, of the May 19, 2003 Response After Final, is unpersuasive for failure to provide evidence that the Applicant's slurry shows advantages that are unexpected and unsuggested by the references. The Applicant respectfully submits that the slurry does show advantages that are unexpected and unsuggested by the references, based not on conclusory statements, but by specific results submitted as Exhibit A in the declaration signed by the Applicant and submitted with the current response. In particular, as stated in the declaration, the results presented in the graph of Exhibit A were unexpected because they showed a reduction in the patterned erosion rate of an interlayer dielectric material by an order of magnitude. The

patterned erosion rate was around 4000 Ang/min when a copper polish slurry without a surfactant containing alkyltrimethylammonium cations was used, and the patterned erosion rate was around 400 Ang/min when 0.5 weight percent of cetyltrimethylammonium bromide (CTAB), which will produce alkyltrimethylammonium cations, was added to the copper polish slurry. Such dramatic results are particularly unexpected in light of the facts that the surfactants containing alkyltrimethylammonium cations are (1) not typically used in copper polish slurries, and (2) cause the flocculation, or destabilization, of silica-based copper polish slurries having the formulations as claimed in independent claims 1 and 11.

#### **Claim Rejections – 35 U.S.C. § 103**

The Examiner has rejected claims 1-4, 6-11, 13, 14 and 16 under 35 USC 103(a) as being unpatentable over Kaufman et al. (U.S. Patent No. 5,954,997) in view of Feller et al. (U.S. Patent No. 5,700,383) and further in view of Grumbine et al. (U.S. Patent No. 6,083,419). Furthermore, the Examiner has rejected claims 5,12, and 15 under 35 U.S.C 103(a) as being unpatentable over the combination of Kaufman, Feller, and Grumbine as applied to claims 1, 4, 6-11 and 16 above and further in view of various combinations of Neville et al. (U.S. Patent No. 5,527,423), Kato et al. (U.S. Patent No. 5,904,159), and Tsai et al. (U.S. Patent No. 5,575,706).

The Applicant respectfully traverses. It would not be obvious to formulate a copper polish slurry containing a surfactant containing an alkyltrimethylammonium cation, a chelating buffer system; an abrasive comprising silica; an oxidizer; and a corrosion inhibitor; wherein the slurry has a pH between 2.5 and 7.0 as claimed by the applicant in independent claims 1 and 11 in light of the cited references. First of all, it would not be obvious to combine the Grumbine and Kaufman references. This is because, as described above and in the attached declaration, the corrosion inhibitors including cetylmethylammonium hydroxide, tricaprilmethylammonium chloride, and tetramethylammonium hydroxide and mixtures

thereof as taught by Grumbine for the use in a chemical mechanical polishing slurry for tungsten would not be used in a copper polish slurry such as the one taught by Kaufman. In fact, Kaufman expressly teaches the use of a different corrosion inhibitor, namely benzotriazole (BTA), as the preferred corrosion inhibitor for copper polish slurries. Corrosion inhibitors that would be used in tungsten polish slurries would not be obvious to use in copper polish slurries because tungsten and copper have different corrosion and oxidation properties. Specifically, when tungsten is oxidized, a thin oxide film forms on the metal layer that passivates the remainder of the metal layer, thus preventing further oxidation of the metal below the oxidized layer. In contrast, copper does not form a stable passivating oxide layer. Instead, the copper continues to oxidize until an oxidizing agent to which the copper is exposed is removed.

Additionally, the Applicant's invention is not obvious in light of the cited references because it is based on unexpected results. This reasoning is discussed above, and is also described in the attached 37 CFR 1.132 declaration signed by the inventor.

Therefore, the Applicant respectfully submits that the claims 1, 4, 6-11, and 16 are not made obvious in light of the cited references, either individually or in combination.

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Reply to Office Action of March 17, 2003

If there are any additional charges, please charge Deposit Account No. 02-2666.

Respectfully submitted,

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